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A COMPOSITE BOARD AND METHOD OF PRODUCING SAME

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(56) Prior Art Documents
AU 549598 10737/83 B29J 5/02
AU 549980 10736/83 B29J 5/02
AU 543305 69302/81 B29J 5/02

(57) Claim

1. A method for producing a comminuted lignocellulosic building product of at least one layer, wherein the or each layer is prepared by blending native lignocellulosic material as hereinbefore defined with a thermal bonding agent comprising 2% to 9% w/w polymeric diphenyl methane diisocyanate, thereafter shaping and curing the blended mixture to form a layer.

10. A comminuted lignocellulosic building product of at least one layer, wherein the or each layer comprises a shaped and cured mixture of native lignocellulosic material as hereinbefore defined with 2% to 9% w/w of polymeric diphenyl methane diisocyanate as the thermal bonding agent.

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Complete Specification for the invention entitled:

A COMPOSITE BOARD & METHOD OF PRODUCING SAME

The following statement is a full description of this invention, including the best method of performing it known to me:—*

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* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

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The present invention relates to a method of producing a comminuted building product, particularly a composite board, from lignocellulosic material as well as to the product itself.

The lignocellulosic material employed in the present invention includes Australian cereal straw and bagasse and any other lignocellulosic material found typically on mainland Australia and Tasmania and nearby Asian Oceanic countries which have a mineral fraction content of 2% to 20% by weight, a nitrogen content of less than 1% without additives, and a silica content of between 1% and 17% by dry matter. Such lignocellulosic material possess properties of structure and composition unique to that region, and is to be hereinafter referred to as "lignocellulosic material as hereinbefore defined".

As a practical consideration, the internodes of the lignocellulosic material and where appropriate, the sectional areas of leaf are to be used, with the vascular tissue comprising between about 11% and 36% by weight of lignocellulosic material.

It is an object of the present invention to provide an improved method for the production of comminuted lignocellulosic building products which utilizes the lignocellulosic material as hereinbefore defined in conjunction with an appropriate thermal bonding agent.

It is a further object to provide a comminuted lignocellulosic building product which comprises the lignocellulosic material as hereinbefore defined in conjunction with, inter alia, an appropriate thermal bonding agent.

It has now been found that the appropriate binder for the raw lignocellulosic material as hereinbefore defined is polymeric diphenyl methane diisocyanate (MDI), and that a range of between 2% to 9% of MDI is sufficient to produce a composite board of appropriate strength.

According to one aspect of this invention there is provided a method for producing a comminuted lignocellulosic building product of at least one layer, wherein the or each layer is prepared by blending lignocellulosic material as hereinbefore defined with 2% to 9% w/w polymeric diphenyl methane diisocyanate, thereafter shaping and curing the blended mixture to form a layer. Optionally, one or more release agents may be present in the blended mixture.

According to a further aspect of the invention there is provided a comminuted lignocellulosic building product of at least one layer, wherein the or each layer comprises a shaped and cured mixture of lignocellulosic material as hereinbefore defined with 2% to 9% w/w of polymeric diphenyl methane diisocyanate as the thermal bonding agent. Optionally, one or more release agents may be present in the shaped and cured product.

Preferably, the raw lignocellulosic material used in this invention has a fibre length less than about 50mm.

The shaping of the blended mixture is preferably carried out by compression in a hot press at between about 4 and 8 kg per cm^2 pressure.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the following example of a preferred method for producing a comminuted lignocellulosic building product according the invention.

After harvest of the wheat straw, bales of approximately half ton weight were prepared and pairs of these were double dumped by a hydraulic ram to produce a series of one ton bales of increased density. These bales were then transported to a milling machine for fractionation. The fractionation was achieved by placing each bale on a hopper type conveyor system, breaking down to bale structure so that the straw assumed a random covering of the conveyor surface and could be uniformly fed along the conveyer to the fractionating head of the milling machine where the straw is chopped into a mixture of smaller fibre sizes of length less than about 50mm. The chopped straw was then removed and stored.

8.5 tonnes of the wheat-derived chopped straw was introduced per hour into a mixing enclosure and the bonding agent polymeric diphenyl methane diisocyanate was sprayed through an atomizer into the mixing enclosure where it mixed

with the straw for 5 minutes to form a 5% w/w mixture with the straw. The resultant material was conveyed from the mixing enclosure and shaped in a mat former before being conveyed to a hydraulic ram operated hot press for compression. The mat was compressed at about 6 kg/cm^2 pressure and at a temperature of about 150°C. The bonding agent was cured by the effect of the heat generated on the surfaces of the press.

The compressed mat was then cut to the desired size by a trim saw.

Hardeners, and other structure forming components may be introduced into the mixing enclosure to strengthen the finished particle board.

One-core or two-core boards may be produced by adaptation of this process. For the production of a one-core board, larger fractionated straw as treated above of a fibre length up to about 50 mm is shaped and placed on the base of a hot press before being compressed in a manner appropriate to achieve the desired properties of the one-core building product.

For the production of a two-core bord, a sandwich of larger fractionated straw as defined above placed between layers of finely fractionated straw as treated above of a fibre length up to about 15mm is compressed in a manner appropriate to achieve the desired properties of the two-core building product.

Release agents may be required, however the caull and

platen plates of the hydraulic ram may be made of aluminium which will serve as a release agent.

The strength of the resultant composite board is dependent largely on the proportion and distribution of bonding agent in the lignocellulosic mixture, the average size of the fractionated lignocellulosic material, and the cross-orientation of the finished lignocellulosic product. The strength of straw boards produced by this process will vary according to these parameters. A measure of the board's strength is the "modulus of rupture" which may vary according to the contribution of the various structural parameters.

It will be readily apparent to persons skilled in the art that various modifications may be made in details of product and procedure without departing from the scope and ambit of the invention.

For instance, depending on the compression pressures used, the building product of the invention may be of high, medium or low density structure and so serve a number of different functions.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method for producing a comminuted lignocellulosic building product of at least one layer, wherein the or each layer is prepared by blending native lignocellulosic material as hereinbefore defined with a thermal bonding agent comprising 2% to 9% w/w polymeric diphenyl methane diisocyanate, thereafter shaping and curing the blended mixture to form a layer.

2. The method according to claim 1 further including the step of introducing one or more release agents to the mixture being blended.

3. The method according to claim 1 or claim 2 wherein the said lignocellulosic material has a fibre length less than 50mm.

4. The method according to any one of claims 1 to 3 wherein the blended mixture is shaped in a hydraulic ram operated press comprising a caull and platen plates by compression between the caull and platen plates of the hydraulic ram operated press.

5. The method according to claim 4 wherein compression is carried out at a pressure of between 4 and 8 kg per cm^2.

6. The method according to claim 4 wherein the caull and platen plates are aluminium and the aluminium plates serve as the release agent.

7. The method according to any one of claims 4 to 6 wherein the blended mixture is cured by the effect of the heat generated on the caull and platen plates.

8. The method according to any one of claims 4 to 7 wherein the heat generated on the caull and platen plates during compression reaches a temperature of 150°C.

9. The method according to any one of claims 1 to 8 further including the step of introducing a hardener to the mixture being blended.

10. A comminuted lignocellulosic building product of at least one layer, wherein the or each layer comprises a shaped and cured mixture of native lignocellulosic material as hereinbefore defined with 2% to 9% w/w of polymeric diphenyl methane diisocyanate as the thermal bonding agent.

11. The comminuted lignacellulosic building product according to claim 10 further including one or more release agents.

12. A comminuted lignocellulosic building product whenever prepared by a method of any one of claims 1 to 9.

13. A comminuted lignocellulosic building product substantially as hereinbefore described with reference to the example.

14. A method for producing a comminuted lignocellulosic building product, said method being substantially as hereinbefore described with reference to the example.

DATED this 14th day of February, 1992.

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